

WHAT IS CLAIMED IS:

Claim 1. (Original) An assembly for mooring a vessel (2) at sea to a body (1) comprising

a yoke (10, 10') selectively disconnectably coupled between said vessel (2) and said body (1) and having first and second ends with a non-disconnectable coupling arrangement between said first end and said body and a disconnectable coupling arrangement between said second end and said vessel,

said non-disconnectable coupling arrangement including a pivoted connection between said first end of said yoke (10, 10') and said body (1) that allows said yoke to rotate about a horizontal axis,

said disconnectable coupling arrangement including a first coupling member (32, 32') at said second end of said yoke which is arranged and designed for mating with a second coupling member (34, 34') carried by said vessel (2), and

a tension member (20, 110) arranged and designed to extend through said first and second coupling members and to be coupled between a winch mechanism (18, 18', 106) and a connector (42, 42'), said mechanism and connector being arranged and designed to pull said first coupling mechanism (32, 32') into engagement with said second coupling mechanism (34, 34'), and

a selectively operated locking mechanism (80) arranged and designed between said first and second coupling members (32, 34) to lock said yoke (10) to said vessel (2), thereby mooring said vessel (2) to said body (1) or to unlock said yoke (10) from said vessel (2) thereby allowing said tension member (20, 110) to be uncoupled from said connector (42) for disconnecting said yoke (10) from said vessel (1).

Claim 2. (Original) The assembly of claim 1 wherein

said body (1) is an LNG process vessel, and said vessel (2) is an LNG carrier vessel.

Claim 3. (Original) The assembly of claim 2 comprising,

a buoyant element (28) located at said second end of said yoke (10) to cause said second end of said yoke (10) not to sink when said first and second coupling members are selectively disconnected and said second end of said yoke (10) rotates about said horizontal axis into the sea.

Claim 4. (Original) The assembly of claim 2 wherein,

said first coupling member includes a male guide cone (32) mounted on a multiple axis joint (30) which is attached to said second end of said yoke (10), and

said second coupling member includes a female receiver (34) mounted on an extension (8) of said vessel (2) and arranged and designed to receive said guide cone (32).

Claim 5. (Original) The assembly of claim 4 wherein,

said connector (42) is mounted on said extension (8),

said winch mechanism (21) is mounted on said yoke (10), and

said tension member (20) extends from said connector (42) through said multiple axis joint and via guide wheels (26a, 26b) to said winch mechanism (21).

Claim 6. (Original) The assembly of claim 4 wherein,

said multiple-axis joint is a spherical ball joint.

Claim 7. (Original) The assembly of claim 2 wherein,

said tension member is a chain (20) having a chain end fitting (19),

said connector is a chain stopper (42) mounted on a shock absorber (44) carried by an extension (8) of said vessel (2), said chain stopper arranged and designed for selectively clamping said chain end fitting (19), whereby,

said shock absorber (44) minimizes shock loads to said chain (20) while said first coupling member (30, 32) is pulled toward said second coupling member (34).

Claim 8. (Original) The assembly of claim 2 wherein,

said connector is a selectively operated clamping device carried by an extension (8) of said vessel (2),

said tension member has a fitting (19) arranged and designed for being secured by said clamping device, and

guide wheels (130, 114) are mounted on a support bracket (136) carried by an elastomeric spring (120) at said second end of said yoke (10).

Claim 9. (Original) The assembly of claim 8 wherein,

said tension member is a rope (110).

Claim 10. (Original) The assembly of claim 4 wherein,

said multiple-axis joint (30) is mounted on a pedestal (35) at said second end of said yoke (10), and

bumpers (36) are mounted on said pedestal (35) at a position below said guide cone (32) and arranged and designed to provide a cushioned stop for said guide cone at extreme deflection angles.

Claim 11. (Amended) A method of mooring a vessel (2) to a body (1) in the sea comprising the steps of,

providing a mooring yoke (10) with a first end pivoted at said body and with a second end having a guide cone (32) and buoyant element (28) provided thereon with said second end of said yoke floating on the sea,

providing a winching mechanism with a tension member (20) and pull-in rope (40) paid out, with said ~~guide~~ pull-in rope extending through said guide cone (32),

mounting a receiver (34) on said vessel (2),

providing a messenger rope (17) wound on a winch (48) on said vessel (2),

connecting said messenger rope (17) to said pull in rope (40) and pulling said messenger rope (17) and said pull in rope (40) until said tension member (20) is within said receiver (34),

clamping said tension member (20) in said receiver (34),

winding said tension member (20) on said ~~windlass~~ winching mechanism (18), thereby pulling said second end of said yoke (10) upward from the sea while pulling said guide cone (32) into said receiver (32) on said extension member (8), and

selectively locking said receiver (34) and said guide cone, thereby mooring said vessel (2) to said body via said yoke (10).

Claim 12. (Original) The method of claim 11 further comprising the step of

pulling said vessel (2) toward said body (2) with hawsers (12a, 12b) connected to winches (119) on said body (1) while said messenger rope (17) pulls tension member (20) into said receiver (34) and while said tension member (20) is pulled by said ~~windlass~~ winching mechanism (18) until said guide cone (32) is pulled in said receiver (34).

Claim 13. (Original) The method of claim 11 wherein

said winching mechanism is a windlass (18) mounted on said mooring yoke (10).

Claim 14. (Original) The method of claim 11 wherein said

winching mechanism is a rope winch mounted on said body (1).

Claim 15. (Original) An assembly for mooring a first vessel (2) at sea to a second vessel (1) comprising,

a yoke (10') selectively disconnectably coupled between said first vessel (2) and said second vessel (1) and having first and second ends with a non-disconnectable coupling arrangement between said first end and said second vessel (1) and a disconnectable coupling arrangement between said second end and said first vessel,

said non-disconnectable coupling arrangement including a pivoted connection between said first end of said yoke and said second vessel that allows said yoke (10') to rotate about a horizontal axis,

said second end of said yoke having a buoyant element (28) to cause said second end of said yoke (10') not to sink when said second end of said yoke rotates about said horizontal axis into the sea,

said disconnectable coupling member including a first coupling member (32') at said second end of said yoke which is arranged and designed with a second coupling member (34') carried by said first vessel (2), and

a selectively operated locking mechanism (80) arranged and designed between said first and second coupling members (32, 34) to lock said yoke (10) to said vessel (2), thereby mooring said vessel (2) to said body (1) or to unlock said yoke (10) from said vessel (2) thereby allowing said tension member (20, 110) to be uncoupled from said connector (42) for disconnecting said yoke (10) from said vessel (1).

Claim 16. (Original) The assembly of claim 15 further comprising

a tension member (20, 110) arranged and designed to extend through said first and second coupling members and to be coupled between a winch mechanism (18, 18', 106) and a connector (42, 42'), said winch mechanism and connector being arranged and designed to pull said first coupling mechanism (32, 32') into engagement with said second coupling mechanism (34, 34').

Claim 17. (Original) The assembly of claim 16 wherein

said winch mechanism (100') is mounted on said second vessel (1).

Claim 18. (Original) The assembly of claim 16 wherein

said winch mechanism (18) is mounted on said yoke (10).

Claim 19. (Original) The assembly of claim 16 wherein

said first coupling member includes a male guide cone (32') mounted on a multiple axis joint (90) which is attached to said second end of said yoke (10'), and

said second coupling member includes a female receiver (34') mounted on an extension (8) of said first vessel (2) and arranged and designed to receive said guide cone (32').

Claim 20. (Original) The assembly of claim 19 wherein

said multiple axis joint (90) is an elastomeric flex joint in combination with an internal vertical axis yaw bearing.

Claim 21. (Amended) The assembly of claim 19 wherein

said multiple axis joint (90) is a two-axis gimbaled joint in combination with an internal vertical axis yaw bearing (91).